

What is claimed is:

1. An implant for treatment of a curved spinal column segment, comprising:  
a body including first and second ends attachable to respective ones of first and second vertebrae along surfaces of the first and second vertebrae comprising a concavely curved surface of the spinal column segment, said body being structured to distract the spinal column segment along the concavely curved surface toward a straightened configuration while permitting motion of the spinal column segment when attached to the first and second vertebrae.
2. The implant of claim 1, wherein said is formable between a first condition and a second condition, said body being formed to said second condition for attachment to the first and second vertebrae and reforming toward said first condition from said second condition to continuously distract the first and second vertebrae when attached thereto.
3. The implant of claim 2, wherein said body is formable by compressing said body between said first and second ends.
4. The implant of claim 2, wherein said body comprises a shape memory material, said body being formable by changing a phase of said shape memory material.
5. The implant of claim 1, wherein said first end of said body includes a first hole for receiving a first bone anchor engageable to the first vertebra and said second end includes a second hole for receiving a second bone anchor engageable to the second vertebra.

6. The implant of claim 5, wherein said body includes at least one reinforcement member embedded therein adjacent at least one of said first and second openings.

7. The implant of claim 6, wherein said at least one reinforcement member extends at least partially around said adjacent opening.

8. The implant of claim 1, wherein said body includes a stiffness which varies along a length of said body between said first and second ends.

9. The implant of claim 8, wherein said body is compressible from a first condition to a second condition and is resilient to reform from said second condition to said first condition to continuously distract the spinal column segment when attached thereto.

10. The implant of claim 9, wherein said body includes a number of reinforcing members embedded therein.

11. The implant of claim 1, wherein said body includes a chamber along a mid-portion thereof, said chamber including a fluid therein.

12. The implant of claim 11, further comprising a secondary device in said chamber adapted to imbibe said fluid in said chamber in response to compressive and tensile forces exerted on said body upon motion of the spinal column segment.

13. The implant of claim 1, wherein said body includes a lower surface directed towards the spinal column segment when said body is attached thereto, said body further including an upper surface opposite said lower surface.

14. The implant of claim 13, wherein said body includes an enlarged mid-portion between said upper and lower surfaces.

15. The implant of claim 14, wherein said enlarged mid-portion includes a pyramidal shape between said first and second ends of said body.

16. The implant of claim 14, wherein said enlarged mid-portion includes a bulbous shape between said first and second ends of said body.

17. The implant of claim 13, wherein said lower surface includes a U-shape adapted to extend at least partially around an anterior portion of the first and second vertebrae.

18. The implant of claim 1, wherein said body includes a length sized for attachment to adjacent first and second vertebrae of the spinal column segment.

19. The implant of claim 1, wherein said body extends from said first end to said second end along a longitudinal axis, said body further includes a medial axis orthogonally oriented to said longitudinal axis between said first and second ends, and said body tapers in width from said medial axis toward each of said first and second ends.

20. The implant of claim 19, wherein said body includes a first portion on a first side of said medial axis and a second portion on a second side of said medial axis, said first and second portions each having a generally triangular shape.

21. The implant of claim 19, wherein said body includes a height between a lower surface and an upper surface thereof, said height tapering from said medial axis toward each of said first and second ends.

22. The implant of claim 1, wherein said body extends along a longitudinal axis from said first end to said second end, said body including a first portion extending between said first and second ends, said first portion being offset laterally from said longitudinal axis to form a gap between said first and second ends.

23. The implant of claim 22, wherein said first portion of said body includes a shape selected from the group consisting of: semi-circular, semi-oval, semi-rectangular, and triangular.

24. The implant of claim 22, wherein said body includes a second portion extending between said first and second ends offset laterally from said longitudinal axis in a direction opposite said first portion of said body, said first and second portions forming an opening through said body between said first and second ends.

25. The implant of claim 24, wherein said first and second portions of said body form a shape between said first and second ends selected from the group consisting of: circular, oval, diamond, and chain-shaped.

26. The implant of claim 24, wherein said first and second portions of said body are hingedly coupled together adjacent at least one of said first and second ends.

27. An implant for distracting first and second vertebrae of a spinal column segment, comprising:

a body with a length along a longitudinal axis, said body including a first condition and a second condition, said body being implantable intravertebrally in said second condition with said length extending between the first and second vertebrae, said body including means for reforming from said second condition to said first condition when implanted to exert a distractive force between the first and second vertebrae and permit relative motion between the first and second vertebrae.

28. The implant of claim 27, wherein said body includes a stiffness which varies along said length.

29. The implant of claim 28, wherein said body includes an enlarged mid-portion and said stiffness increases toward a medial axis of said body.

30. The implant of claim 29, wherein said enlarged mid-portion includes a bulbous shape.

31. The implant of claim 29, wherein said enlarged mid-portion includes a pyramidal shape.

32. The implant of claim 29, wherein said body includes a lower surface positionable adjacent the first and second vertebrae and a base portion along said lower surface having a substantially constant thickness along said body, said body further including an upper portion extending from said base portion and including said enlarged mid-portion, said upper portion including a thickness between said base portion and an upper surface of said body, said thickness varying along a length of said upper portion of said body.

33. The implant of claim 32, wherein said lower surface defines a U-shape transverse to said longitudinal axis.

34. The implant of claim 32, wherein said thickness tapers from a medial portion of said body toward opposite ends of said body.

35. The implant of claim 27, wherein said body includes a medial axis orthogonal to said longitudinal axis, said body including a first portion on one side of said medial axis and a second portion on the other side of said medial axis, each of said first and second portions forming a generally triangular shape with a base of each of said generally triangular shapes positioned adjacent one another along said medial axis.

36. The implant of claim 35, wherein each of said first and second portions include an anchor hole opposite said base of said generally triangular shape thereof.

37. The implant of claim 27, wherein said body is formed to said second condition by compressing said body along said longitudinal axis and said means for reforming includes a resilient material comprising said body.

38. The implant of claim 27, wherein said body comprises a shape memory material and said means for reforming includes changing a phase of said shape memory material.

39. The implant of claim 27, wherein said body includes a first end and an opposite second end along said longitudinal axis, said body including a first portion extending between said first and second ends, said first portion being offset laterally from said longitudinal axis to form a gap between said first and second ends.


40. The implant of claim 39, wherein said body is formed from said first condition to said second condition by moving said first and second ends toward one another along said longitudinal axis.

41. The implant of claim 39, wherein said first portion of said body includes a shape selected from the group consisting of: semi-circular, semi-oval, semi-rectangular, and triangular.

42. The implant of claim 39, wherein said body includes a second portion extending between said first and second ends, said second portion being offset laterally from said longitudinal axis in a direction opposite said first portion, said first and second portions forming an opening through said body between said first and second ends.

43. The implant of claim 42, wherein said first and second portions of said body form a shape between said first and second ends selected from the group consisting of: circular, oval, diamond, and chain-shaped.

44. The implant of claim 42, wherein said first and second portions of said body are hingedly coupled together adjacent at least one of said first and second ends.

45. A system for treatment of a curved spinal column segment, comprising:  
a first anchor engageable to a first vertebra;   
a second anchor engageable to a second vertebra; and  
a body positionable intravertebrally along surfaces of the first and second vertebrae comprising a concavely curved surface of the spinal column segment and attachable thereto with said first and second anchors, said body being structured to distract the spinal column segment along the concavely curved surface and between the first and second anchors toward a straightened configuration while permitting motion of the spinal column segment when attached to the first and second vertebrae.

46. The system of claim 45, wherein said body extends between a first end and an opposite second end, said first and second ends attachable to respective ones of the first and second vertebrae of the spinal column segment with respective ones of the first and second anchors, said body being formable from a first condition to a second condition, wherein said body is formed to said second condition for attachment to the first and second vertebrae and reforms toward said first condition from said second condition to continuously distract the first and second vertebrae.




47. The system of claim 46, wherein said body is formable by compressing said body between said first and second ends.

48. The system of claim 46, wherein said body comprises a shape memory material and said body is formable to said second condition by changing a phase of said shape memory material to move said first and second ends toward one another.

49. The system of claim 48, wherein said body includes a first portion extending between said first and second ends, said first portion being offset laterally from a longitudinal axis of said body to form a gap between said first and second ends.

50. The system of claim 46, wherein said body includes a chamber, a fluid imbibing device in said chamber, and a fluid in said chamber, wherein said fluid imbibing device imbibes said fluid over time to expand said body from said first condition to said second condition against said first and second anchors.

51. A method for correcting a spinal column segment, comprising:   
attaching an implant to surfaces of the spinal column segment defining a concavely curved side of the spinal column segment; and  
distracting the concavely curved side of the spinal column segment with the implant.

52. The method of claim 51, wherein distracting the concavely curved side includes distracting between first and second anchors engaged to first and second vertebrae, respectively, of the spinal column segment.

53. The method of claim 51, further comprising:  
providing the implant with a body formable between a first condition and a second condition;  
attaching the implant includes attaching the implant in the second condition; and  
distracting the concavely curved side includes reforming the implant to the first condition.

54. The method of claim 53, further comprising moving the first and second ends of the implant toward one another to form the second condition.


55. The method of claim 54, wherein moving the first and second ends of the implant includes changing a phase of a material comprising the implant.

56. The method of claim 55, wherein reforming the implant includes increasing a temperature of the implant.

57. The method of claim 51, wherein the implant includes a body portion extending between a first end and a second end, the body being laterally offset between the first and second ends to form a gap between the first and second ends.

58. The method of claim 57, wherein the implant includes a second body portion between the first and second ends, the second body portion being laterally offset between the first and second ends in a direction opposite the lateral offset of the body portion, the body portions forming an opening between the first and second ends.

59. The method of claim 57, wherein moving the first and second ends of the implant includes compressing the implant between the first and second ends.

60. A method for distracting vertebrae of a spinal column segment, comprising:  
positioning a body intervertebrally along the vertebrae;   
moving opposite first and second ends of the body toward one another to form the body from a first condition to a second condition;  
attaching the body to the vertebrae in the second condition; and  
reforming the body from the second condition toward the first condition to continuously distract the vertebrae.

61. The method of claim 60, wherein moving opposite first and second ends of the body includes compressing the body and reforming the body includes the body resiliently returning toward an uncompressed state.

62. The method of claim 60, wherein attaching the body includes attaching the body to the vertebra with first and second anchors.

63. The method of claim 62, wherein reforming the body includes applying a distraction force between the first and second anchors.

64. The method of claim 60, wherein positioning the body includes positioning the body on surfaces of the vertebrae defining a concavely curved portion of the spinal column segment.

65. The method of claim 60, wherein the body includes a body portion offset laterally between the first and second ends to form a gap between the first and second ends.

66. The method of claim 65, further comprising:  
positioning a second body intervertebrally along the vertebrae, the second body including a second body portion offset laterally between first and second ends thereof to form a gap between the first and second ends;  
moving opposite first and second ends of the second body toward one another to form the second body from a first condition to a second condition;  
attaching the second body to the vertebrae in the second condition; and  
reforming the second body from the second condition toward the first condition to continuously distract the adjacent vertebrae.

67. The method of claim 66, wherein the body portions are offset laterally to opposite sides from one another, the body portions forming an opening between said first and second ends thereof.

68. The method of claim 65, wherein the body portion is comprised of shape memory material and reforming the body includes changing a phase of the shape memory material.

69. The method of claim 60, wherein the body is comprised of shape memory material.

70. A method for distracting vertebrae of a spinal column segment, comprising: /

positioning a body intervertebrally along the vertebrae, the body being made from a shape memory material;

moving opposite first and second ends of the body toward one another to stress the body into a stress-induced martensite condition;

attaching the body to the vertebrae in the stress-induced martensite condition; and

releasing the stress from the body to reform the body to an austenitic state thereby continuously distracting the vertebrae.

71. The method of claim 70, wherein attaching the body includes attaching the body to the vertebra with first and second anchors.

72. The method of claim 71, wherein releasing the stress results in a distraction force being applied between the first and second anchors.

73. The method of claim 70, wherein positioning the body includes positioning the body on surfaces of the vertebrae defining a concavely curved portion of the spinal column segment.

74. The method of claim 70, wherein the body includes a body portion offset laterally between the first and second ends to form a gap between the first and second ends.

75. The method of claim 74, further comprising:

positioning a second body intervertebrally along the vertebrae, the second body including a second body portion offset laterally between first and second ends thereof to form a gap between the first and second ends;

moving opposite first and second ends of the second body toward one another to stress the second body into a stress-induced martensite condition;

attaching the second body to the vertebrae in the stress-induced martensite condition;

and

releasing the stress from the second body to reform the body to an austenitic state thereby continuously distracting the vertebrae.

76. The method of claim 75, wherein the body portions are offset laterally to opposite sides from one another, the body portions forming an opening between said first and second ends thereof.

77. The method of claim 76, wherein when attached said bodies form a shape between said first and second ends selected from the group consisting of: circular, oval, diamond, and chain-shaped.

78. The method of claim 76, wherein said bodies are hingedly coupled together adjacent at least one of said first and second ends.

79. The method of claim 70, wherein said body includes a shape between said first and second ends selected from the group consisting of: semi-circular, semi-oval, semi-rectangular, and triangular.

80. The method of claim 70, wherein said shape memory material is nitinol.